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SURFACE ACTIVITY OF THE SODIUM α-SULFO FATTY ESTERS

by

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ABSTRACT

Adsorption studies at the A/W, O/W and S/L interfaces have been conducted for six α-sulfo fatty esters, R CH(SO_3Na) COOR' , which behave as wetting agents or detergents depending on the relative lengths of the acid (R) and the alcohol (R') chains. If R and R' are about the same length,the surfactant is a wetting agent; if R and R' are quite different in chain length, the surfactant is a detergent. These esters include: a) sodium hexyl α-sulfopelargonate, sodium heptyl α-sulfopelargonate and sodium octyl α-sulfopelargonate of the wetting agent type, and b) sodium methyl α-sulfomyristate, sodium methyl α-sulfopalmitate and sodium ethyl α-sulfopalmitate of the detergent type. Physical chemical differences between the two varieties of surfactants were sought. Heats of adsorption of these esters onto Graphon, the S/L interface, have also been determined through heat-of-immersion calorimetry. Further, the rates of adsorption of the two varieties of surfactants onto Graphon have been measured following decrease in electrical conductivity during the adsorption process.

The co-areas of all the esters determined at the A/W interface (44 to 59 A^2/molecule) were comparable to those obtained (about 50 A^2/molecule) from the molecular models for perpendicular orientation at the interface. However, the areas were found to be higher by about 10% (49 to 66 A^2/molecule) at the heptane/water and by about 30% (59 to 75 A^2/molecule) at the benzene/water interface than at the A/W interface, indicating that the α-sulfo ester films at the O/W interface are more expanded. The

co-areas of these esters at the S/L interface ranged between 60 and 100 A^2/molecule and the heats of adsorption varied between 3.7 to 5.5 K cals/mole. Both co-areas and the heats decreased with increasing chain length in the molecule, because of increased adsorption due to decreased polarity as the chain length was increased and due to increased repulsion between the polar head groups as the amount adsorbed increased. The rate of adsorption measurements at the S/L interface indicated that the wetting agents adsorb much faster (about 3 to 7 minutes) than the detergents (about 20 to 25 minutes). This difference was attributed to differences in diffusion rates and/or sticking coefficients. Further study of the kinetic factors is needed to determine which is the rate determining step.